

D E C E M B E R 2 0 0 5

**REPORT TO THE CONGRESS**

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Home Health Agency  
Case Mix and  
Financial Performance

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Case Mix and  
Financial Performance

**MEDPAC** Medicare  
Payment Advisory  
Commission

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## Executive summary

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The Congress asked the Commission to investigate the relationship between home health agencies' (HHAs') case mix and their margin of profit or loss on Medicare patients. The role of the case-mix weights in the home health prospective payment system (PPS) is to predict differences in costs of caring for patients and align payments to costs. Ideally, an agency's average case-mix weight would reflect the relative costliness of its caseload compared to an average agency's caseload and have no relationship with margins, all other things being equal. If the case-mix system is not accurately aligned with agencies' relative costliness, then the PPS may overpay some agencies and underpay others, thus creating a relationship between case mix and margin.

An imprecise case-mix system could also create an incentive for agencies to choose to serve patients in profitable groups and avoid patients in less profitable ones. A case-mix system with a strong incentive to avoid certain patients could create access problems for patients in less profitable case groups. Over the past several years, we have found that beneficiaries' access to care is generally good. It appears, however, that some types of beneficiaries may experience some access difficulties (MedPAC 2005, 2004, 2003).

We found that neither case mix nor other key variables explain much of the variation in margins among HHAs; we also found evidence of a small but statistically significant relationship between margin and case mix.<sup>1</sup> The presence of a statistically significant relationship, in a predictive model that is weak, suggests that policymakers should neither make too much out of the relationship, nor dismiss it. We conclude that the Commission should continue to analyze the home health prospective payment system and develop reforms that will improve payment accuracy.

We identified key factors that were most likely to have an impact on margin—case mix, size, type of control, urban or rural location, and region of the country—and built a model to determine whether case mix explained a substantial part of the variation in home health agencies' margins. The model, with all of these factors, was able to explain little (5 percent) of the variation in margin at the agency level. The result of the model is not entirely surprising. Variations in margins are difficult to explain, even in health care industries with mature payment systems and much-studied attributes such as the inpatient hospital (MedPAC 2003). The margin for any provider may be partially related to the payment system and provider characteristics, but it is also related to factors that are hard to quantify, such as the management of the provider, the competitiveness of the market, or local health care practice.

Some data limitations also complicated this research. Unlike the inpatient PPS, the home health PPS has only been in place for five years. We excluded the records of many home health agencies due to concerns about cost reports from facility-based agencies, or missing, incomplete, or implausible reported costs. None of the variables needed to compute agency costs are audited for accuracy. Although these data are sufficient to make descriptive statements about the sector as a whole, or broad sections of the sector and trends, their unreliability at the agency level may influence the regression model in this report.<sup>2</sup>

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## **The prospective payment system in home health care**

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In October 2000, the Centers for Medicare & Medicaid Services (CMS) implemented a prospective payment system (PPS) for Medicare home health care, intended to control the dramatic increase in Medicare outlays for home health care that had occurred during the 1980s and 1990s and to encourage more efficient provision of care. The new payment system, mandated by the Balanced Budget Act of 1997, replaced a policy of cost reimbursement for home health care that had been in effect since the inception of the Medicare program. The PPS was developed during a time of change in home health care. Some of the high estimated aggregate Medicare margin under prospective payment is likely due to the downward trend in the number of visits provided per episode that began in 1997 and persisted in the time that elapsed between the development of the PPS and the implementation of the system. From agency to agency, margins have varied widely. Beneficiaries' access to care has generally been good, though some beneficiaries experience some access problems.

## **The case-mix system in home health PPS**

Medicare pays a fixed amount for all covered home health services provided during a 60-day episode of care.<sup>3</sup> To better match payments to expected costs under the new system, Medicare adjusts these payments to account for differences in patients' expected resource needs, an adjustment known as the case-mix adjustment.

The case-mix system used in the home health prospective payment system was designed in several iterations in a series of demonstrations. The first, experimental versions relied heavily on measures of services, e.g. whether the patient received or was scheduled to receive any type of home health aide care, or whether the patient received care for a wound (Phillips et al. 1992). These experiments established the need for a special outlier system to adjust for particularly low-cost episodes. They also used panels of experts to judge which measures should be excluded from the payment system because the measures were easier for agencies to manipulate or produced perverse incentives.

The final iteration was developed with data from a demonstration of case-mix adjustment (Goldberg, Delargy, Schmitz, Moore, and Wrobel 1999). It used an early version of the patient assessment tool, the Outcomes and Assessment Information Set (OASIS), to measure patients' clinical and functional conditions. The designers also drew upon detailed visit logs to measure the inputs of home health personnel and supplemental information regarding the costs of those personnel from participating agencies. The model they developed relies primarily on the projected needs of the patient, though it does incorporate a measure of the amount of therapy actually used in the episode. This model predicted a substantial amount—about 30 percent—of the variation in the direct costs of home health personnel during an episode of care.

The Health Care Financing Administration (now CMS) applied these weights to a base payment they designed to account for all of the costs associated with an episode of care. That is, the payment uses the product of the case-mix weights and the base payment not only to cover the cost of personnel but also the costs of drugs, supplies, collecting patient assessments, general

administration, and overhead included in the bundled payment.<sup>4</sup> The base payment relied upon a specially collected and audited sample of about 700 home health agencies' cost reports from 1997 and 1998.

### **Assigning the case-mix weight**

To adjust episode payments for expected costs, the PPS uses an 80-category case-mix classification known as home health resource groups (HHRGs). Episodes are assigned to an HHRG category based on the OASIS patient assessment. OASIS responses result in a clinical score (four categories), a functional score (five categories), and a service utilization score (four categories). The 80 possible combinations of clinical, functional, and service utilization scores constitute the HHRG classification system. A case-mix weight, which varies fivefold from 0.5265 to 2.8113, scales the base payment upward if the episode is expected to be more costly than an average episode, or downward if not. Figure 1 (p. 4) illustrates the logic of the case-mix system.

### **Medicare margins and access to care in home health PPS**

The Commission has found that while individual agencies' margins vary widely, aggregate home health Medicare margins have been in the teens since the inception of the PPS (MedPAC 2005, 2004, 2003). Access has been generally good and quality of care has increased. Information from the Office of Inspector General (OIG) and from CMS's Home Health Compare tends to support our findings on access and quality, respectively (OIG 2001a, OIG 2001b). A recent study by the Government Accountability Office (GAO 2004) found Medicare margins nearly identical to those in the Commission's assessment of the adequacy of Medicare home health payments.

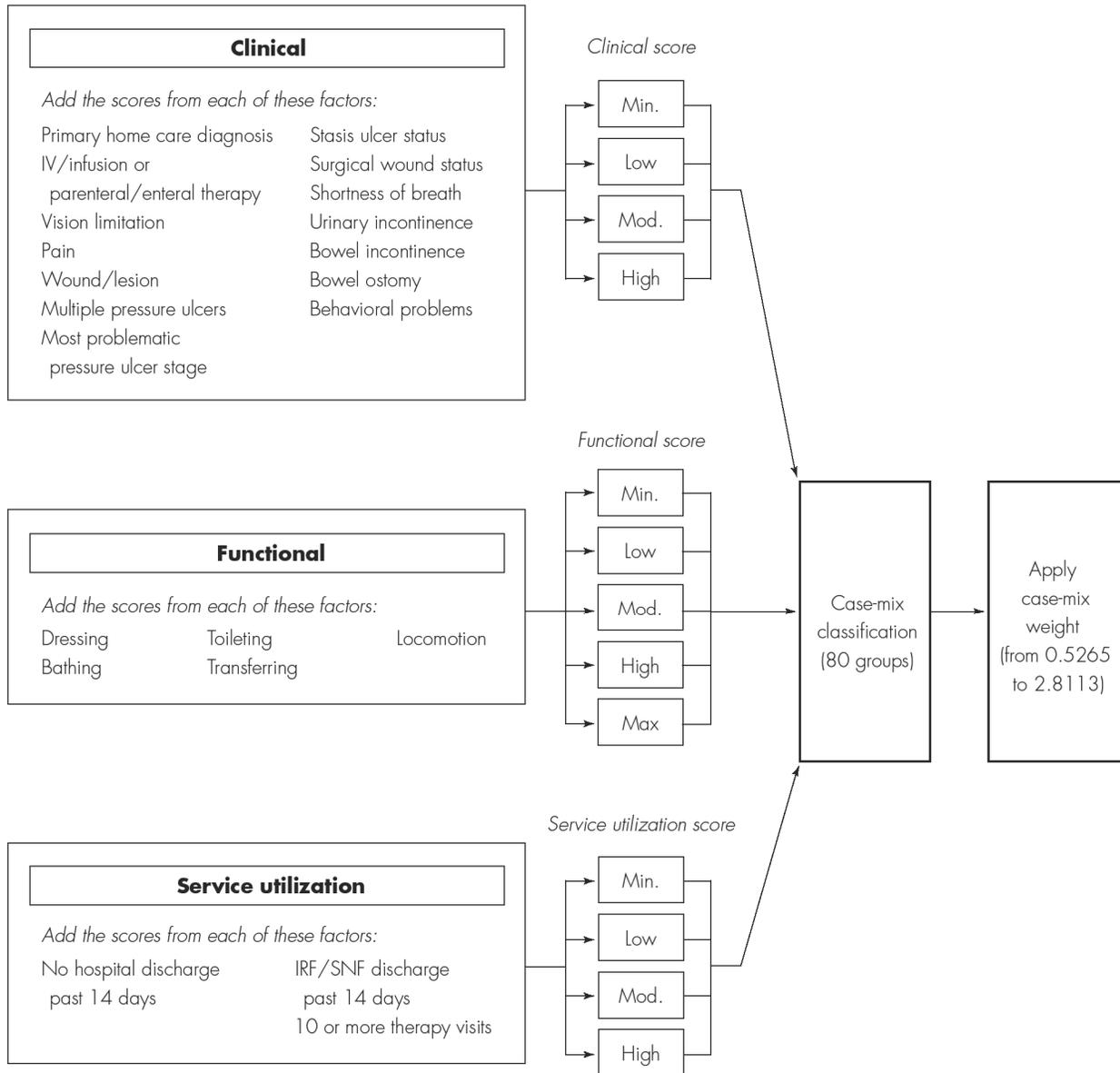
A portion, at least, of the high estimated Medicare margin under prospective payment is likely due to the reduction in both the number of visits and the total number of minutes of care provided, consistent with the new incentives of the PPS (MedPAC 2005). The PPS's episode base payment and the case-mix weights were both computed using data from the cost-reimbursement system of payment, wherein home health agencies had an incentive to maximize the number of visits provided to Medicare home health patients. Prospective payment eliminated this incentive and created new incentives for agencies to deliver care in the most efficient manner possible.

Although it is also possible that agencies might stint on quality care, research by the Commission and CMS points toward improvements in the quality of care (MedPAC 2005). Also, Schlenker, Powell, and Goodrich (2005) reported that measures of function and hospitalization rates of home health patients improved during the first year of prospective payment. At the same time, they observed slight declines in cognitive and behavioral outcomes and in urinary incontinence measures, and suggested that these measures be explored further in coming years.

If the PPS's case-mix system created a strong incentive for providers to avoid certain patients, it could create access problems for patients in less profitable case-mix groups. We considered data from the Consumer Assessment of Health Plans Survey (CAHPS) to determine whether access problems were widespread in home health.<sup>5</sup> It appears that most beneficiaries can obtain care with

**Figure 1**

**Clinical, functional, and service information from OASIS determines patients' home health case-mix classification and case-mix weight**



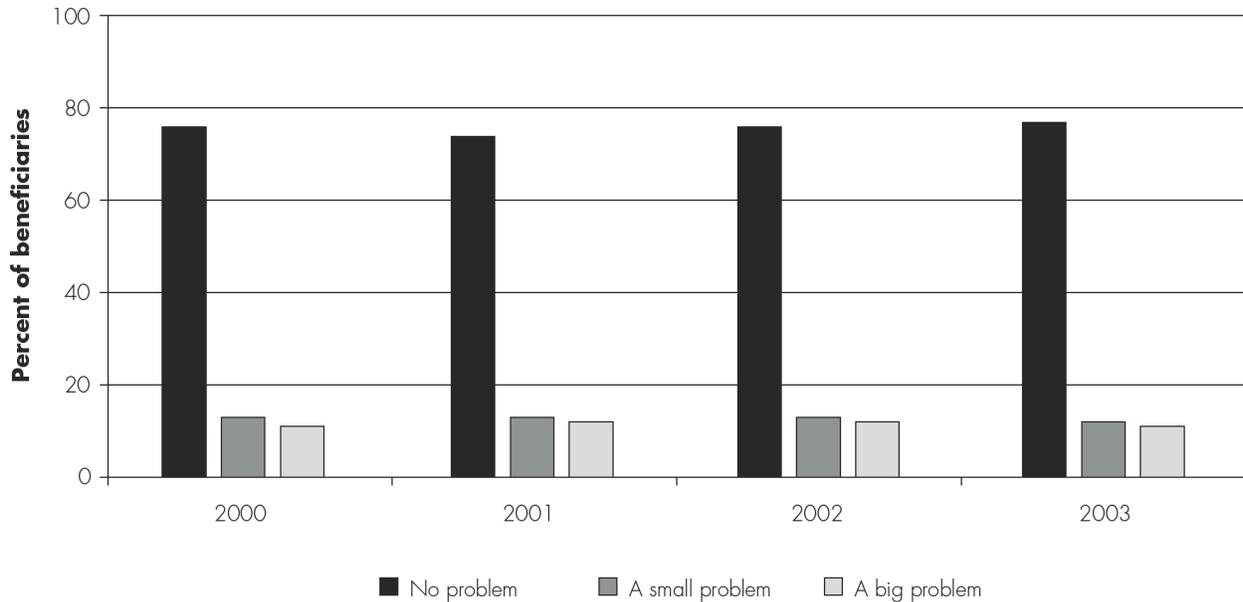
Note: OASIS (Outcome and Assessment Information Set), IV (intravenous), IRF (inpatient rehabilitation facility), SNF (skilled nursing facility).

Source: CMS 2000.

little or no difficulty under the PPS. Though some beneficiaries have problems, nearly 90 percent of the beneficiaries who responded about their home health experiences in 2003 reported that they had little or no difficulty accessing home health services when they sought them (Figure 2). The

**Figure 2**

**Most beneficiaries had little or no problem accessing home health services, 2000–2003**



Note: Percentages are proportions of those who answered the question. Missing responses were not included. The difference between 2002 and 2003 for beneficiaries reporting no problem and a small problem is significant at the  $p < .05$  level.

Source: Consumer Assessment of Health Plans Survey 2004.

percentage of beneficiaries who did not have a problem was higher in 2003 than in 2002, while the percentage of beneficiaries who had a small problem was lower. However, this also suggests that 11 percent of beneficiaries experienced some big problems accessing home health care.

CAHPS does not question beneficiaries about the nature of their access problem. We cannot ascertain from this survey which—if any—personal characteristics differentiated beneficiaries who experienced a big problem from those beneficiaries who experienced no problem; it can only give us some information about access for most beneficiaries. The CAHPS measures include all beneficiaries who sought care, both those who acquired it and those who did not. It cannot differentiate between beneficiaries who are eligible for the Medicare home health benefit and those who are not. Thus, the survey may overestimate the difficulties of beneficiaries who are eligible for the benefit because it includes beneficiaries who were ineligible and had a big problem getting home health because they were not qualified for the benefit.

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## Descriptive analysis of agency characteristics, case mix, and margin

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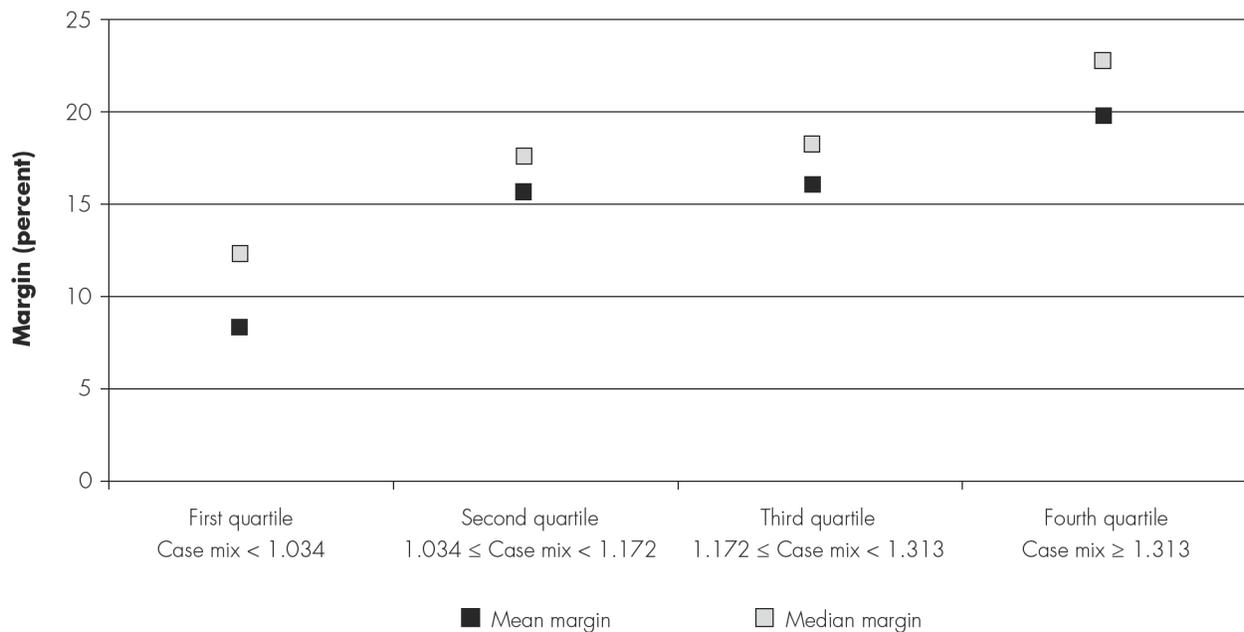
This section presents some descriptive statistics that relate agencies' control, location, and size to their margin. It would certainly appear, at first glance, that case mix is related to Medicare margin. We find that several other agency characteristics appear to be related to margins as well. Because these other characteristics also are correlated with case mix, we need a stronger statistical approach to determine whether a real relationship between case mix and margin exists (we present this in the next section).

### Agency case mix and Medicare margin

We calculated each agency's average case mix by summing the case-mix weights of each episode of care that the agency provided during the year and dividing it by the number of episodes. If the case-mix weights appropriately reflect the expected cost of care, then agencies with high average case mix should exhibit the same Medicare margins, on average, as agencies with low case mix. In other words, there would be no consistent pattern in agency case mix and margin.

**Figure 3**

**Distribution of Medicare margin by agency case mix, 2002  
primary sample**



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Note: Primary sample size is 3,412. The mean margin for agencies in the primary sample is 15.2 percent.

Source: Mathematica Policy Research analysis of 100 percent Standard Analytic File of home health claims, 2002 from CMS.

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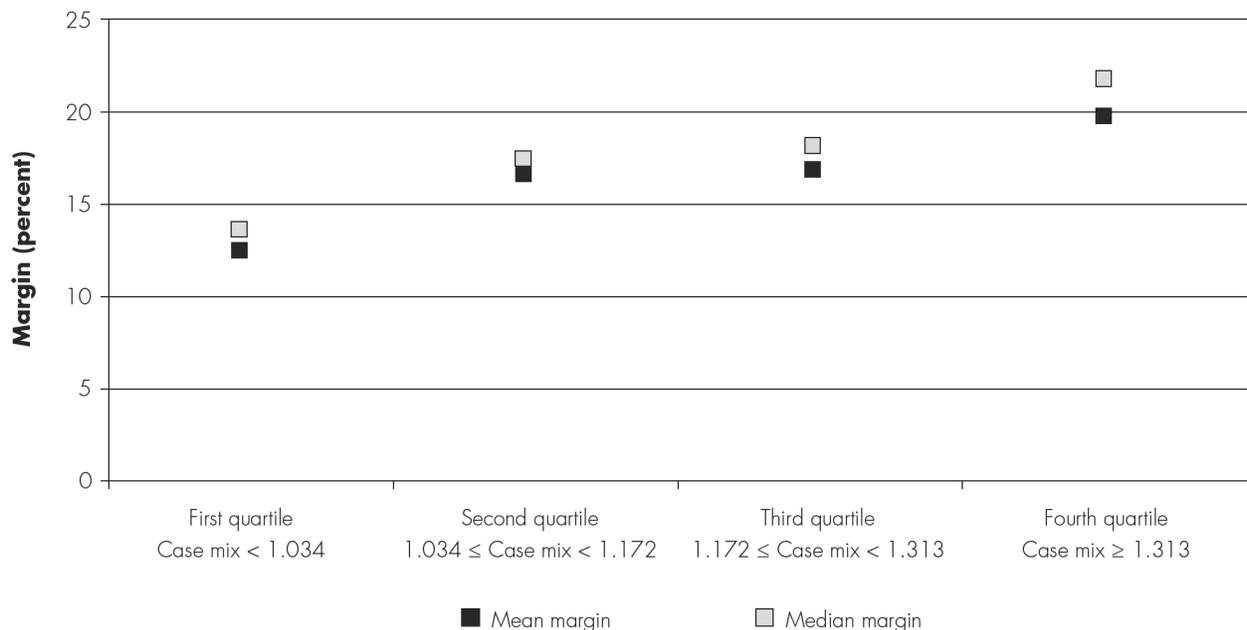
To begin our analysis of the relationship between case mix and margin, we examined the distribution of Medicare margins by quartiles of agency case mix (Figure 3). If we had only this description of case mix and margin, we might believe that case-mix weight and Medicare margin have a strong relationship. The mean margin for agencies in the highest case-mix quartile is more than double that of agencies in the lowest case-mix quartile. The relationship, however, is less evident at the center of the data than at the extremes. The mean margin increases by about seven percentage points between the first and second quartiles and about four points between the third and fourth case-mix quartiles. Between the second and third quartiles however, the mean and median margins are less than a point apart.

An additional trim of the data to remove some of the agencies at the extremes begins to reveal some of the weakness of this relationship (Figure 3-A).

After the trim of agencies with the highest and lowest margins, the difference between the mean margin of the very top quartile and the bottom is narrower than that in Figure 3. The gap between the first and second quartiles narrows to four percentage points; the gap between the third and fourth quartiles narrows to three points. These smaller differences among case-mix quartiles suggest that case mix makes a little less of an impact on margin than we would infer from Figure 3.

**Figure 3-A**

**Trimming the sample narrowed the margins' distribution**



Note: Trimmed sample size is 3,070. The mean margin for the trimmed sample is 15.0 percent.

Source: Mathematica Policy Research analysis of 100 percent Standard Analytic File of home health claims, 2002 from CMS.

**Table 1****Distribution of Medicare margins for home health agencies, 2002**

	Mean	Median	First quartile	Third quartile	Standard deviation	Number of observations
<b>Overall</b>	<b>15.2%</b>	<b>17.7%</b>	<b>4.0%</b>	<b>29.9%</b>	<b>24.4%</b>	<b>3,412</b>
<b>Type of control</b>						
For profit	16.3	18.5	4.8	30.8	24.3	2,452
Voluntary	14.2	16.3	4.2	27.2	21.8	619
Government	9.7	15.8	-3.9	29.1	28.1	341
<b>Location</b>						
Urban	15.2	17.2	3.9	30.0	24.6	2,501
Rural	15.2	19.8	4.6	29.8	23.8	911

Source: Mathematica Policy Research analysis of cost report data from CMS.

### Agency characteristics and Medicare margin

The question of whether case mix is driving differences in margins becomes more complicated when we explore other agency characteristics and find that they too have a relationship with margin. We examined distribution of the estimated Medicare margin over all agencies as well as the margins for subsets of agencies by their characteristics: type of control, urban or rural location, and size. Each of these characteristics also appeared to have some relationship with margin.

The mean margin over all 3,412 agencies was 15.2 percent; the median was slightly higher (Table 1). The variation among margins was substantial, as suggested by the large standard deviations. One quarter of agencies earned margins in excess of 29.9 percent, one quarter of agencies had margins below 4 percent.

Type of control refers to the for-profit, voluntary, or government operation of the agency. Location refers to the urban or rural location of the main office of the agency. The margin among for-profit agencies was 16.3 percent, higher than the margin for voluntary agencies, and much higher than the margin for government agencies.<sup>6</sup> Although the mean margin was the same, the median margin among rural agencies exceeded that for urban agencies. The 25th and 75th percentiles of each of these distributions were very similar.

Greater agency size, as measured by the number of episodes of Medicare home care provided, is also associated with a greater Medicare margin. The median margin of agencies is 4 to 5 percentage points higher for the largest agencies (the top quartile of volume) than for the smallest ones (agencies in the bottom quartile).

**Table 2****Distribution of case-mix score by agency size, 2002**

	Mean	Median	First quartile	Third quartile	Standard deviation	Number of observations
Very small (<154 annual episodes)	1.17	1.15	1.00	1.32	0.25	822
Small (154–371 annual episodes)	1.20	1.19	1.06	1.33	0.22	882
Large (371–803 annual episodes)	1.20	1.20	1.08	1.32	0.20	874
Very large (>803 annual episodes)	1.19	1.20	1.07	1.31	0.19	834

Source: Mathematica Policy Research analysis of 100 percent Standard Analytic File of home health claims, 2002 from CMS.

Not only do control, location, and size all appear to have relationships with margins in the tables above, but they also have relationships with case mix. Case-mix weights among for-profit agencies were higher than among voluntary or government agencies and were higher among urban agencies. Case mix is also related to size. The largest agencies had higher case mix than the smallest, although case mix peaked in the middle (Table 2).

The relationships among margin and case mix and other agency characteristics help explain why the relationship between case mix and margin from Figure 3 (p. 6) might not be as simple as it appears. In the next section, we discuss regression models that estimate the relationship of case mix to margin when the other key variables are held constant.

## Multivariate analysis of margin

We constructed a regression model of Medicare margins to determine whether case mix explained a substantial portion of variation in margin, keeping other factors equal. We found a small but statistically significant positive relationship between case mix and margin; however, we also found that using all of the key variables we have identified (type of control, urban or rural location, size, and geographic region) explained almost none of the variation in Medicare margins ( $R^2 = .05$ ). Neither removing the data for agencies with extreme margins nor adding data on beneficiary characteristics (such as the presence of informal care in addition to the care provided by the agency) substantially altered the results.

**Table 3****Least-squares estimates of determinants of the payment-to-cost ratio**

	Log of the payment to cost ratio	
	Primary sample coefficient	Trimmed sample coefficient
Intercept	0.12	0.10*
Log case mix	0.22*	0.17*
Rural	0.02	0.02*
Government	-0.10*	-0.03*
Voluntary	-0.06*	-0.03*
Log volume	0.01*	0.01*
New England	0.12	0.10*
East North Central	0.04*	0.03
West North Central	0.08*	0.07*
South Atlantic	0.04	0.02
East South Central	0.00	0.01
West South Central	-0.05*	-0.03
Mountain	0.01	0.01
Pacific	-0.02	-0.01

Note: Primary sample size is 3,411. Trimmed sample size is 3,070. R<sup>2</sup>=.05.  
\*Coefficient is significant p<.05.

Source: Mathematica Policy Research analysis of 100 percent Standard Analytic File of home health claims, 2002 and cost report data from CMS.

**Agency case mix, characteristics, and Medicare margin**

Our model included the key variables discussed in the previous section along with data on the geographic region of the home health agency (Table 3). The dependent variable in our model is the margin, defined as the log of the ratio of payments to costs. We employed this definition of the margin because the Commission's typical margin  $\left(\frac{\text{payments}-\text{costs}}{\text{payments}}\right) \times 100$  tends to be difficult to model at the extremes of the distribution.

The model yields estimates of the impact of each variable on margin. The coefficients of the variables quantify the effect of each of these factors on the dependent variable, which is the log of the payment to cost ratio. In other words, the coefficient on the case-mix variable indicates that a one percent increase in an agencies' case-mix score results in two-tenths of a percent increase in the payment to cost ratio, holding all of the other factors in the model equal. As another example, the negative parameter estimate on the government variable indicates that government agencies' margins are on average 10 percent lower than nongovernment agencies, holding all the other factors in the model equal.

The results in the right-hand column of Table 3 are influenced by the presence of some agencies with very low or very high margins. To get an idea of how much influence these outliers have on our results, we re-ran the model on a sample that excluded 10 percent of the agencies with the most extreme margins, high and low. The results of the trimmed model are shown in the left-hand column. The significance of the relationship between case mix and margin persists after the trim; but the estimate of its impact falls from 0.22 to 0.17. The overall power of the model, as measured by the r-squared statistic, does not change.

We expected the model to have limited ability to explain variations in margin. A more refined model of inpatient hospital margins only explained about half of the variation in margin (MedPAC 2003). Variations in margins are difficult to explain, even in health care industries with mature payment systems and much-studied attributes such as the inpatient hospital (Kane and Magnus 2001). Our model did not include all of the factors that are likely to be related to margin because we were trying to build a relatively simple model with agency characteristics that could readily be quantified and were most likely to relate to the variation in margin based on the analysis described in the previous section. Though quality, competition, and management are all likely to be related to margin, we could not identify widely-used or tested methods of quantifying them for home health agencies.

Sources for home health cost data have some substantial limitations. The records of over one-third of the home health agencies in the program cannot be used due to concerns about facility-based agencies, or missing, incomplete, or implausible reported costs (see appendix). None of the variables necessary to compute agency costs are audited for accuracy. While these data are sufficient to make descriptive statements about the sector as a whole, or broad sections of the sector, the regression model in this report may be influenced by the data's unreliability at the agency level. In light of these concerns, the several layers of trims applied to these data appear to be appropriate (Table B–1, p. 24).

## **Beneficiary characteristics and Medicare margin**

We augmented the multivariate model to investigate whether we could improve its predictive power by including measures of beneficiary characteristics, as captured by OASIS assessments. Some of these beneficiary characteristics, such as informal support, are not included in the case-mix system. The mean value of each patient measure is computed at the agency level. Agencies are categorized as above-median or below-median for each measure (Table B–2, p. 26).

In general, we found no evidence that patient characteristics, as captured by OASIS, are related to the Medicare margin. Only one of the patient characteristics we added to the model (patients who received no informal support and had many limitations in activities of daily living (ADLs)) had a statistically significant relationship to margin but its direction was counter-intuitive; this variable's parameter estimate calls into question the reliability of this variable. One would expect these patients to be particularly unprofitable; but the parameter estimate suggested that agencies with larger shares of these patients had higher margins than those that did not. The power of the model has not been improved with the addition of these variables.

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## Conclusion

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The Commission has responded to the request from the Congress to investigate the relationship between home health agencies' average case-mix weights and their margin. The models of margin that we have presented and discussed in this paper suggest that the key variables we have identified are weak predictors of the variation in margins among HHAs. Case mix's statistically significant relationship with margins, within a model that is weak, suggests that policy makers should neither make too much out of the relationship, nor dismiss it. The findings of this report, by themselves, do not suggest that the case-mix system is working poorly, but the body of research does suggest that we continue to examine the system that Medicare uses to purchase these services. We discuss some additional research in the next section.

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## Discussion

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The research in this report is consistent with assessments of the home health PPS by the Commission and others in suggesting the need for more research to determine whether some case-mix groups are more profitable than others and whether agencies can manipulate inaccuracies in case-mix adjustment for financial gain.

### The Commission's research

We have noted in several past reports that the change in incentives facing home health agencies after the prospective payment began in 2000 may have changed the relationship between case mix and costs upon which the system was built. The HHRGs are based on a relationship between care provided and patient characteristics that appeared in data collected in 1997 and 1998. During most of this period, agencies had an incentive to provide as many visits as the home health intermediary would approve. At the end of 1998, the incentives were changing as CMS introduced a payment system that was intended as a bridge between the cost-based system and the prospective system. Under the interim system, agencies had a financial incentive to reduce visits wherever possible. Medicare coverage for patients whose only skilled need was the drawing of blood was eliminated. Also, greater oversight provided an incentive for agencies to limit overuse that might be inappropriate. The current PPS also has incentives to reduce the number of visits provided during an episode. Case-mix groups with high weights, and thus high payments, could have offered the greatest scope to reduce visits. To the extent that greater percentage reductions in care occurred in highly weighted case-mix groups, a positive relationship between case mix and margin would be expected to emerge.

Our examination of the average number of minutes of care per episode by case-mix group (MedPAC 2005) also found indications that this system may need refinement. In that work, we found far more variation in the minutes of service per episode provided to patients in the same case-mix group than one would expect if the case-mix groups were accurately predicting costs.

It could be fruitful to explore the relationship between case mix and cost at the episode level. The research in this report has focused on payments and costs at the agency level; the question we have explored is whether the case-mix system is predicting agencies' Medicare margins. Alternatively, we could take this research in a different direction and explore how well the case-mix system explains costs or profits and losses episode-by-episode. To do this, we could examine changes in the average number of visits by case-mix group to see if greater declines occurred among high case-mix groups. We could also develop a measure of cost per episode and examine the correlation between the relative costs of episodes and their relative payment rates. Work at the episode level could point the way toward refinements of the case-mix system if we identify a subset of resource groups that are particularly misaligned. For example, we might find that payments for episodes that meet the therapy threshold are particularly misaligned with costs; this would suggest that the therapy threshold policy should be refined.

### **CMS research**

CMS is conducting research to refine the case-mix system; it plans to begin rulemaking based on the results during the second half of 2006. It has focused on analyzing the accuracy of payments at the episode level. Using data from the first three-and-a-quarter years of the PPS, CMS has focused on performance of the existing case-mix adjuster for long-stay patients. It is exploring whether the second and subsequent episodes of long-stay patients have per-episode costs that differ from first episodes or episodes for patients with shorter stays. CMS has also researched the feasibility of an adjuster for the costs of nonroutine supplies. Currently, each episode receives the same allowance for average nonroutine supplies costs; a supply-cost adjuster would allow payments to vary based on expected supply costs for each case-mix group. The research has also included the prediction of therapy costs and other approaches addressing the therapy visit threshold. A case-mix system with multiple, graduated thresholds might be more accurate than a single-threshold system; a case-mix system without any thresholds could perform even better if therapy could be predicted accurately. CMS is also considering the effects of adding comorbidities or making refinements to diagnosis groups. A final item on their list is an analysis of improvements in Outcome and Assessment Information Set item coding (CMS 2004). They anticipate further work to retest their interim findings on more recent data. The Commission will coordinate with CMS as we pursue our research agenda. ■

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## Endnotes

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1. Generally, margin is defined as  $\frac{(\text{payment} - \text{cost})}{\text{payment}} * 100$ . A slightly different measure is used later in this analysis, see p. 10.
2. A full discussion of data sources and methods is attached in Appendix B.
3. Covered services include skilled nursing, physical therapy, occupational therapy, speech therapy, medical social services, and home health aide services.
4. Very few drugs are included in the home health bundled payment.
5. CAHPS is an annual survey conducted by CMS of about 100,000 fee-for-service Medicare beneficiaries.
6. There is some concern that the margins of government-based agencies may not be comparable to for-profit or voluntary agencies due to allocations of costs and revenues among health care providers who share public budgets.



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**Mandate for report**

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## **Mandate for report**

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### **Medicare Prescription Drug, Improvement, and Modernization Act of 2003, Section 705 (a) and (b).**

#### SEC. 705. MEDPAC STUDY ON MEDICARE MARGINS OF HOME HEALTH AGENCIES.

(a) **STUDY.**—The Medicare Payment Advisory Commission shall conduct a study of payment margins of home health agencies under the home health prospective payment system under section 1895 of the Social Security Act (42 U.S.C. 1395fff). Such study shall examine whether systematic differences in payment margins are related to differences in case mix (as measured by home health resource groups (HHRGs)) among such agencies. The study shall use partial or full-year cost reports filed by home health agencies.

(b) **REPORT.**—Not later than 2 years after the date of the enactment of this Act, the Commission shall submit to Congress a report on the study.



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**Data and methods**

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## Data and methods

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The analysis of Medicare home health margins relies on three principal sources of data: Medicare home health cost reports for 2002, Medicare claims for home health care provided during 2002, and Outcome and Assessment Information Set (OASIS) assessments for beneficiaries receiving home health care in 2002. In this appendix we first describe the three data sources and the process of file and variable construction, including a description of the initial file and the observations trimmed from it. We then outline the analytic approach used to assess the relationship of Medicare margin to characteristics of agencies and home health patients. Finally, we discuss some limitations in the analysis, arising chiefly from the measurement of agency cost.

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### Data sources and file construction

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Although Medicare no longer bases payment for home health care on incurred cost, certified home health agencies must nevertheless complete a Medicare home health cost report for any fiscal year in which they submitted claims for home health care. The cost report details costs incurred in the provision of both covered and non-covered services to Medicare beneficiaries and others.

This analysis excludes cost reports from facility-based home health agencies (HHAs). The wide divergence of margins between hospital-based and freestanding HHAs cannot be accounted for by factors that could cause efficient providers' margins to differ. There are no payment differentials based on whether the agency is freestanding or hospital-based. Hospital-based agencies are about the same size, on average, as freestanding agencies and receive about the same amount of payment per agency on average.

- There is no evidence that hospital-based agencies produce a different product from freestanding agencies: the average number of visits per episode is essentially the same. When we compare the average number of visits per episode by visit type, the similarity persists.
- More hospital-based agencies are rural than freestanding agencies, 48 percent versus 35 percent; however, rural and urban margins are similar.
- Since care is delivered in the patient's home, the location of the agency has no relation to the site of care.

Hospital indirect cost allocation or differences in efficiency would seem to be likely explanations for the differences in margins.

We trimmed the file of 4,575 cost reports covering months in 2002 for freestanding home health agencies in five steps. First, we deleted 594 HHAs because key information (e.g. cost, payments, episode volume) was incomplete or missing entirely. Next, a further 88 were deleted if the cost

report represented fewer than 10 months or more than 14 months. The next three steps removed agencies with extreme values. Agencies were deleted if the log of the ratio of payment to cost exceeded the 90<sup>th</sup> percentile of its distribution plus 1.5 times the interdecile range or if it was less than the 10<sup>th</sup> percentile minus 1.5 times its interdecile range. This trim is typically applied in the Commission’s analysis of margins in the annual assessment of payment adequacy for all settings (inpatient acute care hospital, skilled nursing facility, etc.). However, in the home health sector, this trim still allows implausible values into the analysis. We also trimmed agencies whose reported costs per case were less than \$100 or more than \$10,000. After these trims, the sample still contained agencies with extreme margins. Because margins are the dependent variable in this analysis, and outliers in the distribution could have disproportionate effects on the results, our last step of the trim removed agencies with extreme margins.

Finally, any agency for which no Medicare claim with a valid home health resource group (HHRG) code could be located was dropped. Table B–1 shows the disposition of the 3,411 agency file.

Figure 3-A and Table 3 display the results of an additional trim. We removed the 5 percent of agencies with the highest margins and the 5 percent of agencies with lower margins then re-ran the cross tabulation of margins and case-mix scores and the regression model of variation in home health margins. The trim narrowed the variation in margins by case-mix quartile and had very little effect on the results of the model. This suggests that some agencies with extreme margins did have an impact on the results of the analysis of the 3,411-agency sample but that the extremes were not determining the outcomes on their own.

**Table B–1**

**Home health agency sample used for report**

<b>Reasons for dropping observations from initial file</b>	<b>Number</b>
<b>Initial file</b>	<b>4,575</b>
Incomplete or missing data	– 594
Cost report of <10 or >14 months or <3 months of 2002	– 88
Extreme payment/cost values	– 133
Extreme cost per case values	– 235
No home health claims with valid HHRG codes	– 114
<b>Primary sample</b>	<b>3,411</b>
Extreme margins	– 341
<b>Trimmed sample</b>	<b>3,070</b>

Note: HHRG (home health resource group).

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## Variable construction

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### Agency-level variables

The key outcome variable of interest is the Medicare margin, defined as the percentage discrepancy between Medicare payments and Medicare cost. Total Medicare cost was defined as the sum of Medicare patient service cost, cost of medical supplies, and cost of drugs, all drawn from Worksheet C of the Medicare home health cost report. Total Medicare payment was computed as the sum of Part A and Part B prospective payment system (PPS) payments for all types of home health episodes, drawn from Worksheet D, Part II of the Medicare cost report. In Figures 3 (p. 6) and 3–A (p. 7) and Tables 1 (p. 8) and 2 (p. 9), the Medicare margin was defined as  $\left(\frac{\text{payment}-\text{cost}}{\text{payment}}\right)*100$ . In Table 3 (p. 10), the Medicare margin was defined as the natural log of the ratio of Medicare payments to Medicare cost.

Other agency-level variables drawn from the cost report, the Medicare Provider of Service (POS) file, or from public data sources include: total number of home health episodes provided, agency control (for-profit, voluntary, government), urban or rural location, U.S. census division, and the value of the Medicare home health wage index.

Finally, each agency's case-mix weight was computed from 2002 Medicare home health claims as the mean of the HHRG weights for all episodes matched to the agency's provider identifier. Only regular episodes were included in the case-mix calculation; we did not include episodes with four or fewer visits (these are not paid according to the episode case-mix system), episodes with two or more case-mix weights, or incomplete episodes.

### Beneficiary-level variables

Beneficiary-level measures were extracted from home health claims and from OASIS assessments. Agency-level means were computed for each variable. Table B–2 (p. 26) displays the variable names, definitions, and data sources.

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## Limitations of the analysis

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Because the Medicare margin is computed as the percentage discrepancy between Medicare revenue and Medicare cost, accurate measurement of cost and revenue is critical to the analysis. Medicare revenue is easily calculated as the sum of Medicare payments to an agency. Measuring the incurred cost for providing Medicare home health care is a far more uncertain task.

Most home health agencies provide both covered services, such as skilled nursing and physical therapy, and services that are not covered under the Medicare home health benefit, such as respiratory therapy and homemaker services. Moreover, agencies typically provide services to Medicare beneficiaries and to others under private-pay or other insurance arrangements. As a

**Table B-2****Variable definitions: Characteristics of home health patients**

<b>Variable</b>	<b>Definition</b>	<b>Source</b>
Age	Beneficiary age on 1/1/2002	Home health claim
Race	White/nonwhite	Home health claim
Sex	Male/female	Home health claim
Injectable medications	Agency has above-median share of patients who require assistance with injectable medications	OASIS
Recent hospitalization	Agency has above-median share of patients who were discharged from hospital within 14 days of start of care	OASIS
No support	Agency has above-median share of patients who receive no support other than from agency	OASIS
Behavioral problems	Agency has above-median share of patients who exhibit memory problems, disruption, aggression, or impaired decision making	OASIS
High ADL	Agency's patients have more than the median number of ADL limitations	OASIS
High ADL and no support	Agency's patients who receive no support other than from agency have above median number of ADL limitations	OASIS

Note: OASIS (Outcome and Assessment Information Set), ADL (activity of daily living).

result of this joint production, it is generally impossible to arrive at an unambiguous measure of Medicare cost. Under Medicare rules, a process known as step-down is used to allocate overhead and administrative costs to a home health cost center. Direct service costs and stepped-down costs are summed to arrive at total Medicare home health cost. The step-down approach to cost finding is an accepted accounting practice. Nonetheless, the resulting measure of Medicare cost is to some degree the result of arbitrary assumptions used to allocate overhead cost and is meant to approximate a quantity.

Further problems may arise from the reported data themselves. Since 2000, Medicare payments to home health agencies have not relied on the cost report. Medicare home health intermediaries no longer routinely audit cost reports for accuracy. Agencies therefore have few incentives to devote time and resources to ensuring that their reported costs are correct. Although we have no direct evidence that cost report data are less precise than they were before 2000, there is certainly reason to suspect that some agencies, at least, may be providing less accurate information than they once did.

Whether reported Medicare cost overstates or understates true Medicare cost is impossible to say at this point. Home health agencies have consistently argued that a home health visit provided to

a Medicare beneficiary requires more time and resources than a visit provided to a non-Medicare patient. Consequently, they say, the Medicare cost finding process, which assumes resources are the same in both cases, understates true Medicare cost. All the same, the number of home health agencies expanded briskly in the early 1990s when Medicare based payments to agencies on this very same cost-finding process. This suggests that Medicare cost finding may well have *overstated* cost, leading to positive returns for new entrants in that period. Lacking other external evidence to suggest systematic inaccuracies in the cost report, we believe that it is reasonable to rely on this data source for the analysis.



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**More about MedPAC**

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